

Reducing Hazardous Fuels

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Fuels Treatment

In forestry, fuels refer to flammable material including living and dead plant matter, which accumulate in forests. Fuel loading describes the amount, type and size of fuels present. Forests that have accumulated excessive amounts of fuels are at greater risk of intense, large-scale wildfire. In a natural cycle, fuels are consumed by fire at regular intervals in what is known as a fire regime.^{[1][2][3]} Past practices of fire suppression -- a strategy of quickly putting out fires wherever they occur -- have led to dense forests with excessive fuel loading. The fire hazards posed by these fuel loading issues are now being managed by fuels treatments, such as prescribed burning or thinning.^{[3][4]} Fuels treatments are operations carried out to reduce the amount of standing fuel in a forest, in order to reduce the risk of severe wildfire and protect forest resources or neighboring communities.^[4]

Management Uses

Fuels treatments can, in theory, increase the risk of fire, as treatments can expose remaining fuels to heat from the sun and greater wind speeds.^[5] However, the goal of using fuel treatments is to prevent the risk of extreme fire, not simply fire in general. Modern foresters use a variety of fuel treatments during management to achieve this goal.

Prescribed fire is one commonly used technique. Prescribed fire is the controlled application of fire to an area used to reduce the amount of ground fuels in that area. This lowers the risk of a wildfire becoming out of control. The intensity, or the size and temperature of a fire, of these prescribed burns can vary due to the objective a forester is trying to accomplish.^[6] Low intensity prescribed fires are useful for reducing fuel accumulation on the ground. Conversely, high intensity fire can get rid of "ladder" fuels, which, as the name implies, are fuels that a wildfire can climb to reach the sensitive crowns of trees.^[6]

Thinning, or the cutting of some trees in a stand, is another commonly used fuel treatment. Thinning is useful in that it increases the space between trees -- lessening the likelihood that a fire can spread between trees, through their crowns or across surface fuels.^[6] This is often used in conjunction with fuel removal, which is simply the act of taking fuels out of a stand, as cut trees can be sold for timber.^[6]

Additionally, when conditions are too dangerous for prescribed burning, piling and burning may be used. Piling and burning is very straightforward, as ground fuels are simply dragged into discrete piles and burned in a controlled fashion.^[6] Heavy machinery can be used for piling in areas with heavy pieces of fuel like downed trees. Alternatively, piles can be created by hand in areas with fine pieces of fuel or in areas inaccessible by machinery.^[6]

Mastication is another, less common technique. Mastication is the act of grinding surface fuels into finer particles in order to increase the density of the fuel bed. This treatment is useful because a higher fuel bed density reduces a fire's rate of spread.^[6]

Effects on Resources

The effects of fuel treatments on forests are complex. No treatment can be applied to an area without some drawbacks. For example, treatments that involve the removal of ground cover, such as thinning or fuel removal can increase the rate of soil erosion in an area. Treatments involving heavy machinery can compact soil, making it more difficult for trees to absorb water and nutrients, which reduces tree health and growth.^[7] Use of prescribed fire can increase the risk of tree death by invading insects, as recovering from fire damage reduces trees defensive capability.^[8]

However, not all the effects of fuel treatments are negative. Thinning can reduce catastrophic wildfire by minimizing the ability of a fire to spread to the crown of the trees. Simultaneously, fuels treatments increase the health and growth rate of remaining trees by reducing the competition for soil nutrients, water and light.^[9] Prescribed fire can increase the concentration of important soil nutrients in the form of ash.^[10] In addition, prescribed fire can encourage the growth of natural species composition of oak woodlands.^[11]

Social and Economic Issues

Public opinion of forestry can be controversial. According to surveys, the timber industry is seen by a majority of the public to be responsible for at least moderate damage to the environment.^[12] This is because of historical logging practices that didn't take into account the ecological value of surrounding lands. Current forest management philosophies differ greatly from years past, but there still remains a lack of public understanding of contemporary forest practices.^[12] Modern forestry faces "spiritual, aesthetic, recreational, economic and ethical concerns, as well as ecological ones."^[13] A greater value of the aesthetic beauty can lead to opposition of treatment operations, such as thinning and prescribed burns, which mar the pristine state of the forest.^[14] However, forests in need of fuels treatments are arguably not in a pristine natural state, and foresters intervene in an effort to improve the long-term health of the forest. Members of the public who favor resource production over protection are more likely to see "ugly" scenes as acceptable and would generally be less opposed to fuels treatments.^[14]

Despite its views of the timber industry, the public is more accepting of fuels treatments. Fuels treatments have gained public support as people have become more aware of the fuel loading issues faced in today's forests and have seen the effects of severe wildfires in the absence of treatment. The public is less accepting in areas of naturally infrequent fire, and in areas where prescribed fires have escaped control and damaged private property.^[14] Common public concerns regarding prescribed fires are smoke, the risk of fire escaping and trust in those conducting the burn operation.^[15]

The implementation of fuels treatments has been limited by increased suppression costs, decreased public funding and the low value of small trees in crowded forests.^[1] As wildfires have become more intense and development has moved into the wildland-urban interface, protecting private property has become a costly priority. The already limited funds for fuels treatment and restoration projects have been diverted to pay for fire suppression.^[1]

Recently, Secretary of the Interior Ryan Zinke has pushed for more active management of forests and greater application of fuels treatments to prevent -- rather than suppress -- large costly wildfires.^[16] Additionally, there have been efforts to improve the economic viability of thinning treatments through the sale of alternative wood products such as wood chips, sawdust and biomass fuel.^[17]

References

1. Gorte, R. (2013) *The rising cost of wildfire protection*. Retrieved from <https://headwaterseconomics.org/wildfire/homes-risk/fire-cost-background/>
2. Weston, D. (2010) *What is a fire regime?* Retrieved from <http://oregonexplorer.info/content/what-fire-regime>
3. Agee, J. K., C. N. Skinner. (2005) Basic principles of forest fuel reduction treatments. *Forest Ecology and Management*, 211(1-2): 83-96.
4. Lenart, M. (2014) *Reducing forest fuel loads to decrease wildfire risk*. Retrieved from <http://articles.extension.org/pages/71220/reducing-forest-fuel-loads-to-decrease-wildfire-risk>
5. Martinson, E. J. and Omi, P. N. (2002, April 18). Performance of Fuel Treatments Subjected to Wildfires. *Fire Fuel Treatments, and Ecological Restoration: Conference Proceedings*. 7-13.
6. Hunter M.E., Shepperd W.D., Lentile L.B., Lundquist J.E., Andreu M.G., Butler J.L., and Smith F.W. (2007). *A Comprehensive Guide to Fuels Treatment Practices for Ponderosa Pine in the Black Hills, Colorado Front Range, and Southwest*.
7. Poff, R.J. (1996) Effects of Silvicultural Practices and Wildfire on Productivity of Forest Soils. *Sierra Nevada Ecosystem Project: Final report to congress, Vol. II, assessments and scientific basis for management options*. 477-493.
8. Ganz1, D.J., Dahlsten, D.L., and Shea, P.J. (2002, April 18). The Post-Burning Response of Bark Beetles to Prescribed Burning Treatments. *Fire, Fuel Treatments, and Ecological Restoration: Conference Proceedings*. 143-158.
9. Romme W.H., Floyd-Hanna M.L., Hanna D.D., and Kemp, P. (2002, April 18). Experimental Thinning and Burning of Ponderosa Pine Forests in Southwestern Colorado: Effects on Canopy Structure, Understory Composition, and Fuels. *Fire, Fuel Treatments, and Ecological Restoration: Conference Proceedings*. 103.
10. Carter, M.C., Foster, C.D. (2004, April 5). Prescribed burning and productivity in southern pine forests: a review. *Forest Ecology and Management*, 191(1-3), 93-109.
11. Cocking, M.I., Varner, J.M., and Engber, E.A. (2015). Conifer Encroachment in California Oak Woodlands. *Proceedings of the seventh California oak symposium: managing oak woodlands in a dynamic world*. 505-514

12. China. (2007) *Public perception of forestry industry and environment*. Retrieved from www.fao.org/forestry/12715-02bb61b57cf6eeb4eb57c45078b496970.pdf
13. Ribe, R. G., Matteson, M. Y. (2002) Views of old forestry and new among reference groups in the pacific northwest. *Western Journal of Applied Forestry*, 17(4): 1-10.
14. McCaffrey, S. M. (2006) *Prescribed fire: what influences public approval?* Retrieved from <https://www.nrs.fs.fed.us/pubs/8448>
15. McCaffrey, S., B. Shindler, E. Toman. (2010) Changes in public responses to wildland fuel management over time. *Fire Science Brief*, 102: 2-6.
16. Interior Press. (2017) *Secretary Zinke directs interior bureaus to take aggressive action to prevent wildfires*. Retrieved from <https://www.doi.gov/pressreleases/secretary-zinke-directs-interior-bureaus-take-aggressive-action-prevent-wildfires>
17. Franz, J. (2014) *ASU study reveals economic benefits of forest thinning*. Retrieved from <https://asunow.asu.edu/content/asu-study-reveals-economic-benefits-forest-thinning>